

POINT PRESENT

DOE Solar Decathlon 2022
Team: Cloud 10
Division: Education Building



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Komal Autkar

Sara ElFallah

Sarah Piccoli

Takeru Kanahara

Trevor Wardell

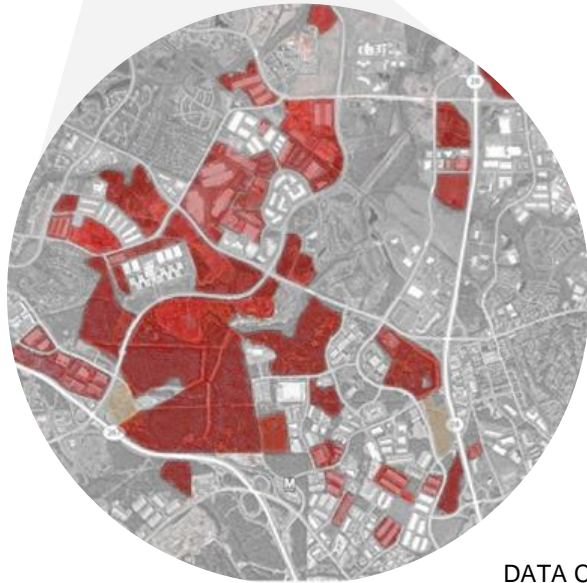
Zheyu Zhang

FACULTY

Susan Piedmont-Palladino

Teminioluwa Thomas





DATA CENTER LOCATIONS
ASHBURN, VIRGINIA

40 MILES



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DESIGN CONSTRAINTS AND GOALS





Potomac Yard
1980's Railyard

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DESIGN CONSTRAINTS AND GOALS





Potomac Yard 2000's Shopping Mall

Credit: North Potomac Yard
Aerial, JBG SMITH Properties

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DESIGN CONSTRAINTS AND GOALS

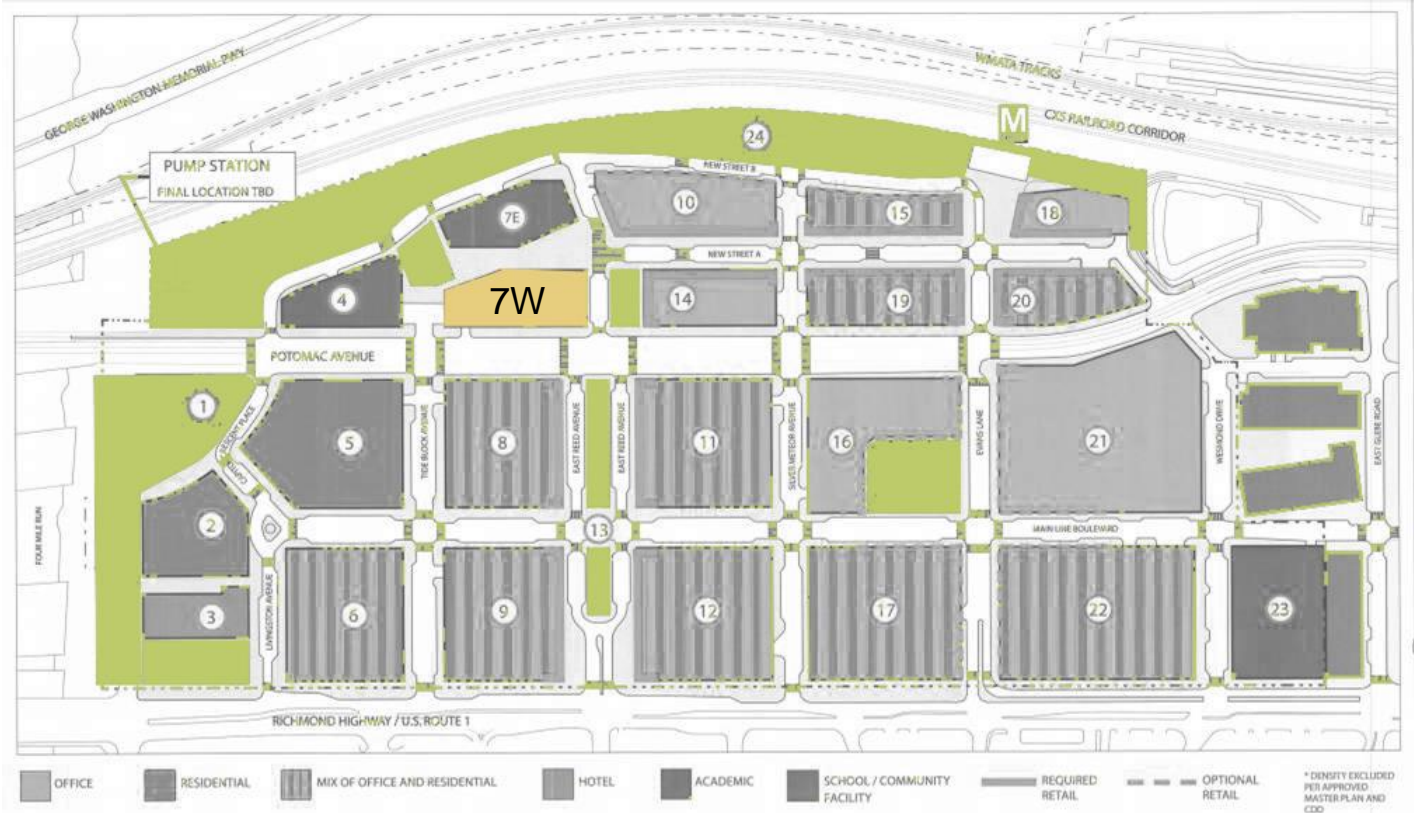


PROPOSED POTOMAC YARD MASTER PLAN (2017)



Credit: North Potomac Yard
Redevelopment, StreetSense

PROPOSED POTOMAC YARD MASTER PLAN (2017)



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DESIGN CONSTRAINTS AND GOALS

PROPOSED POTOMAC YARD MASTER PLAN (2017)



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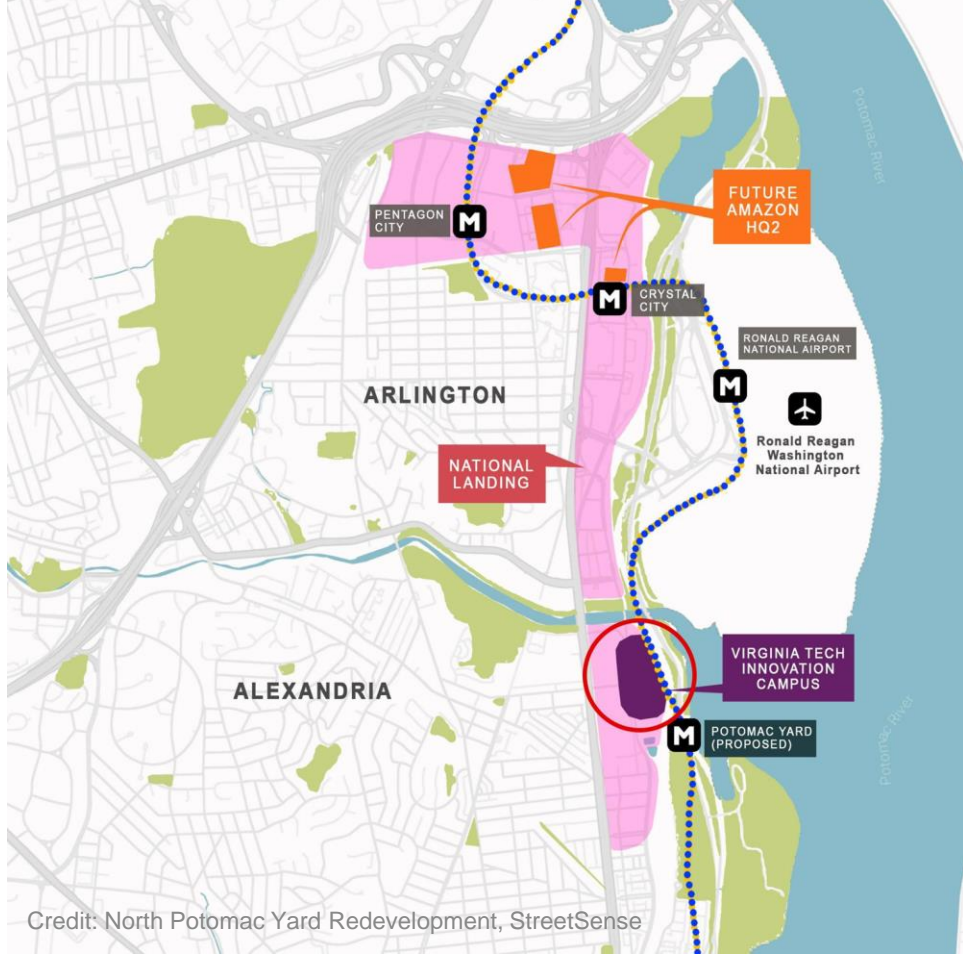
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DESIGN CONSTRAINTS AND GOALS



POTOMAC YARD DEVELOPMENT



Credit: North Potomac Yard Redevelopment, StreetSense

INNOVATION CAMPUS
SMITHGROUP

PARCEL A

PARCEL B



Credit: SmithGroup

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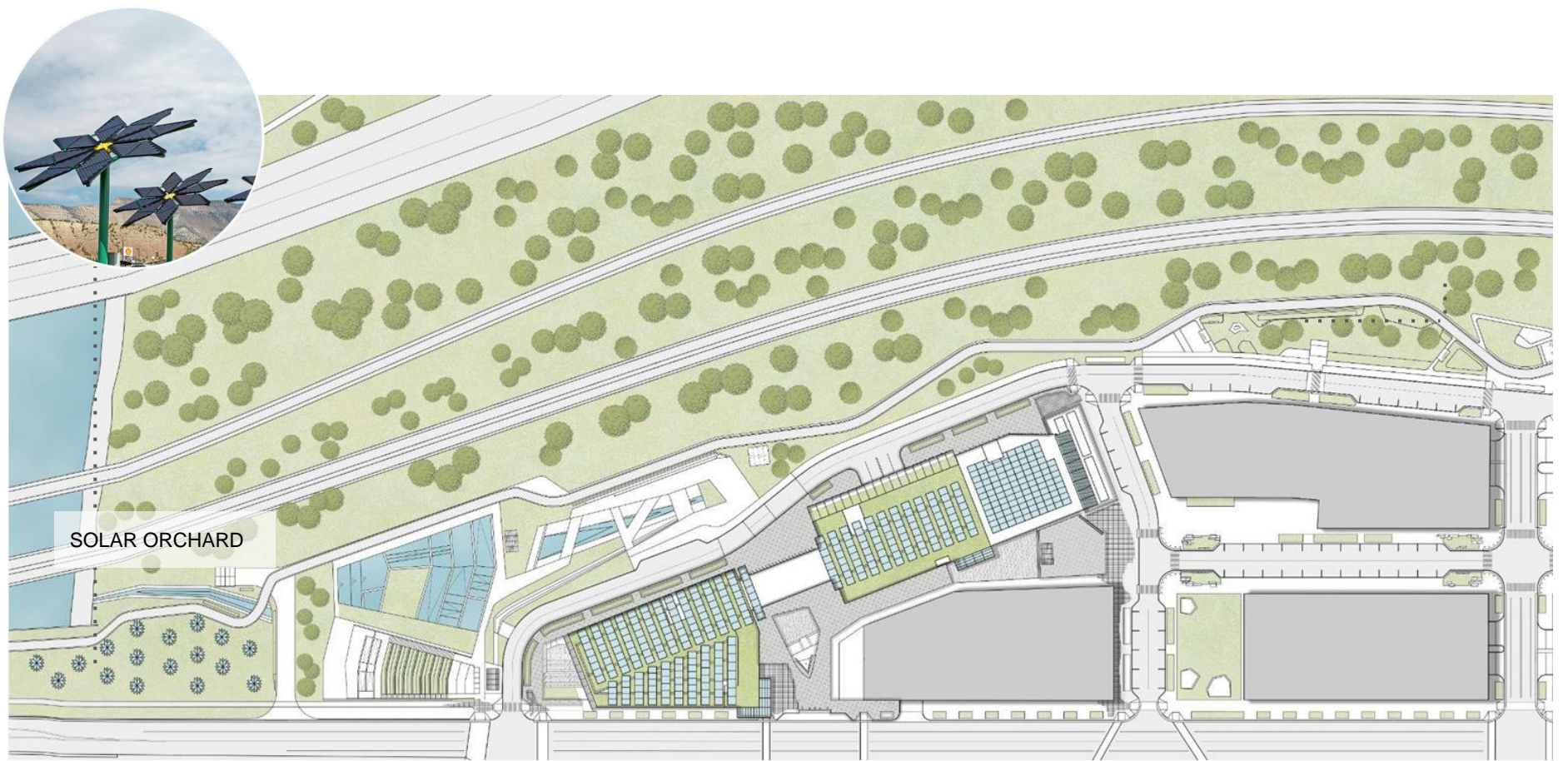
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DESIGN CONSTRAINTS AND GOALS





SOLAR ORCHARD



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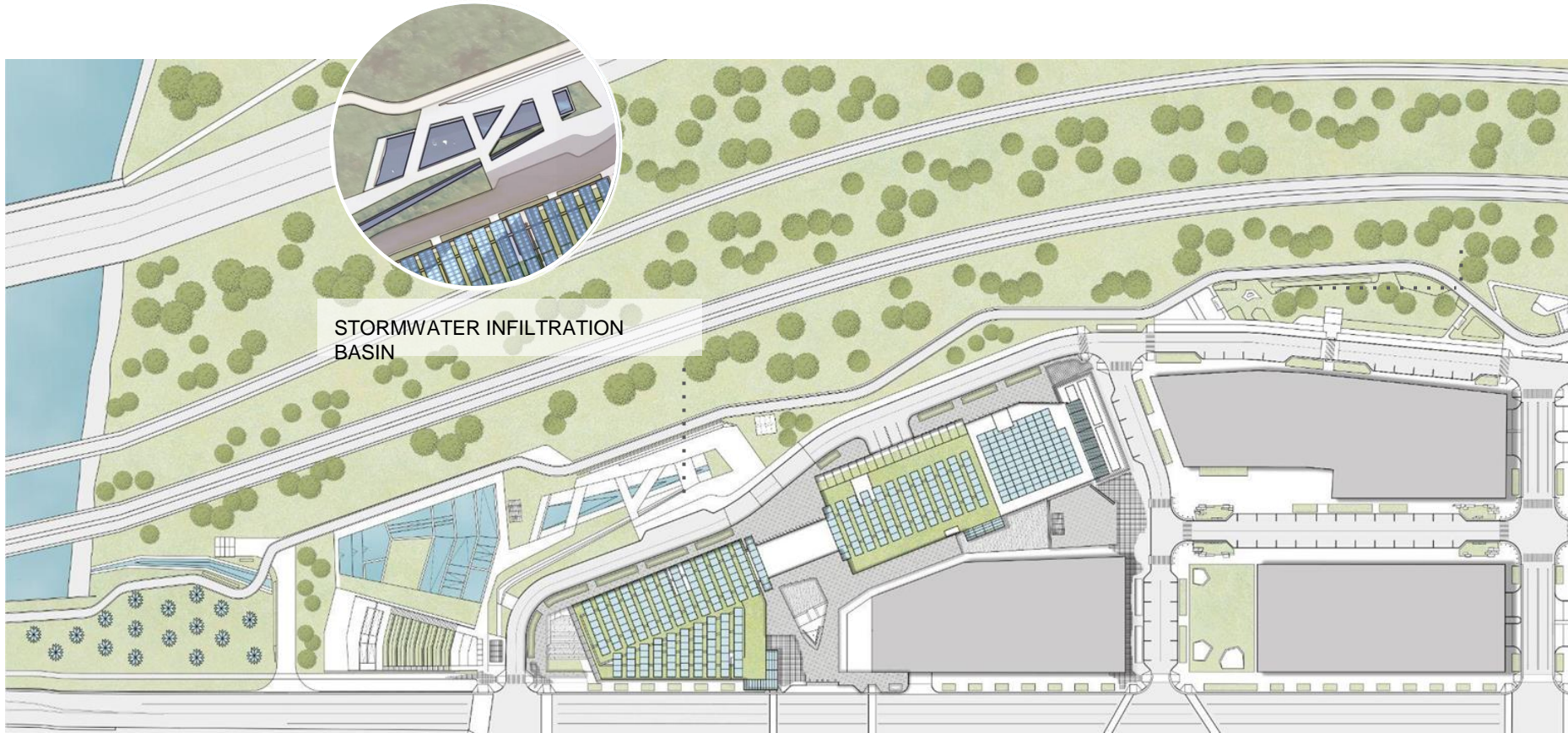
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DURABILITY AND RESILIENCE

INTEGRATED PERFORMANCE





STORMWATER INFILTRATION
BASIN

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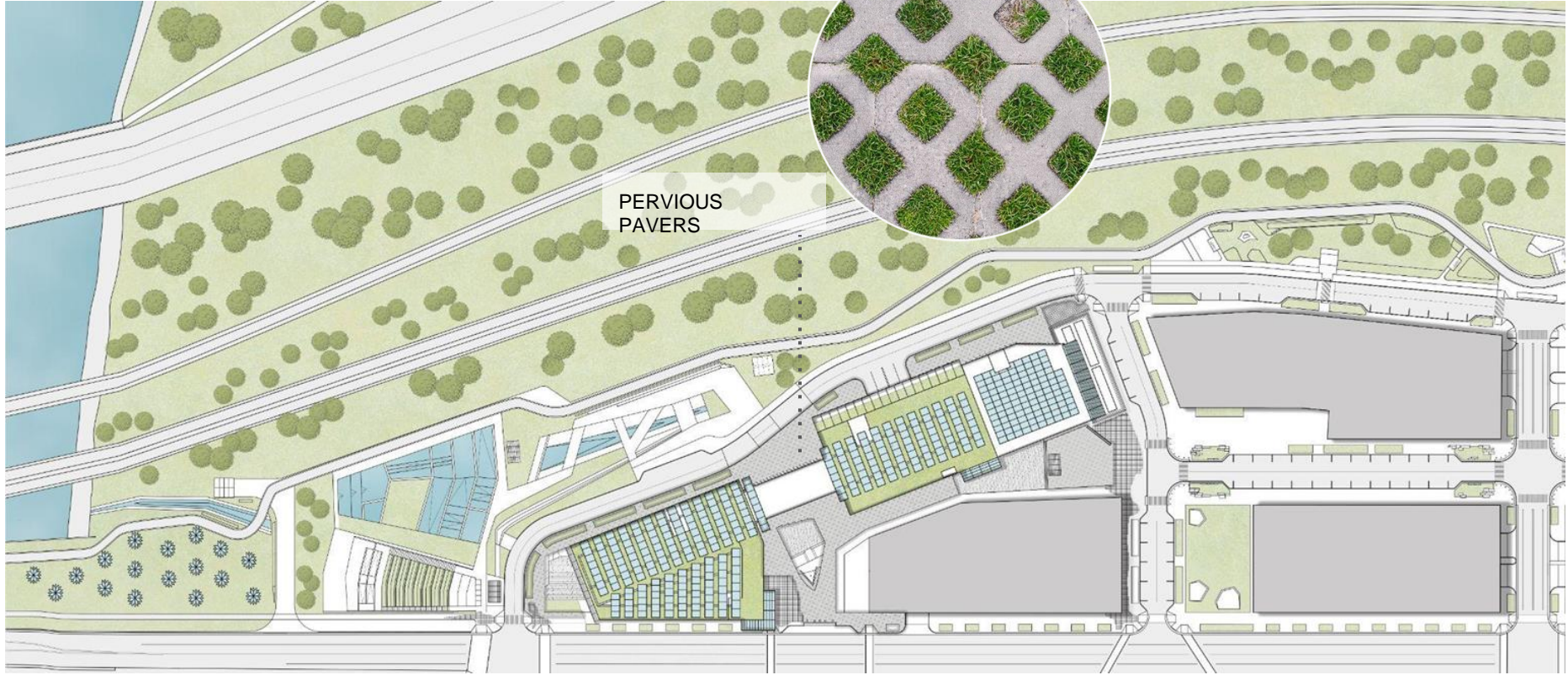
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DURABILITY AND RESILIENCE

INTEGRATED PERFORMANCE



PERVIOUS
PAVERS

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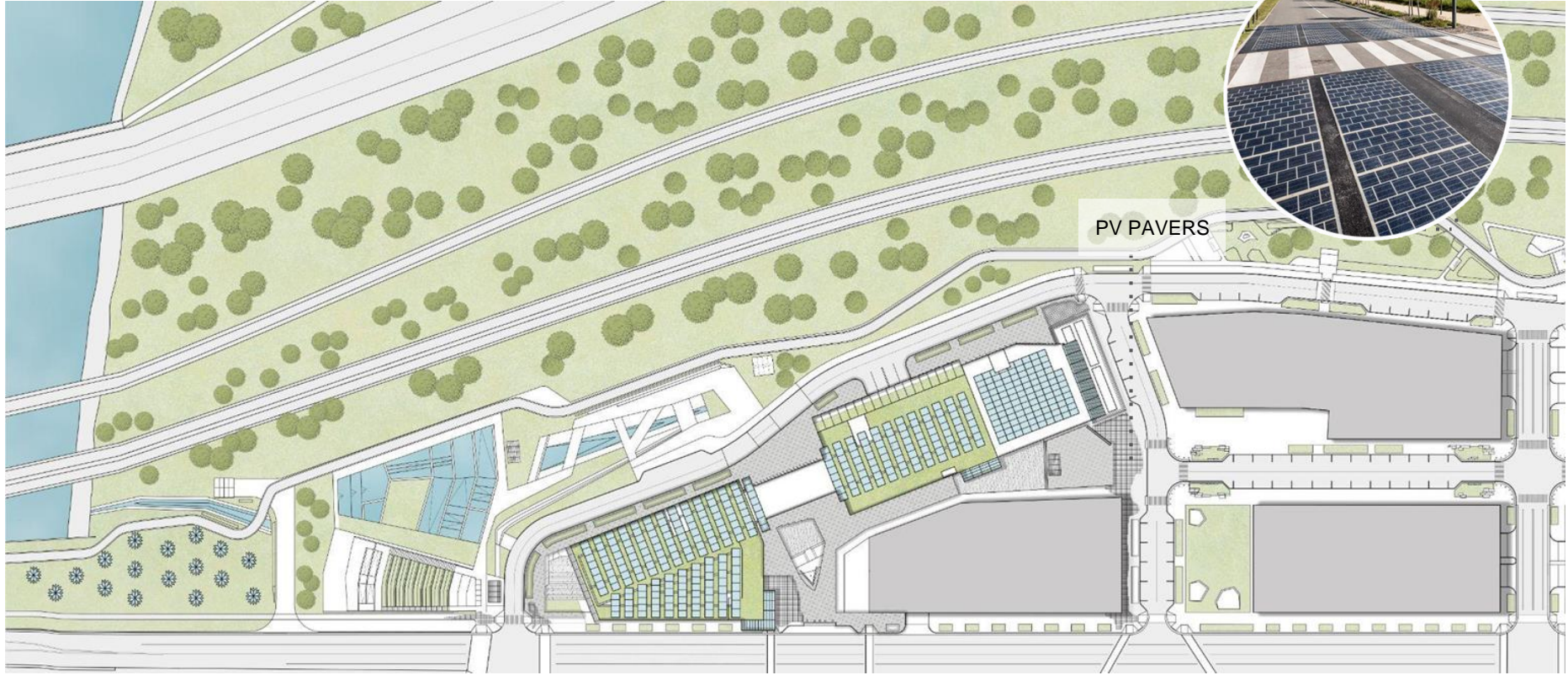
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DURABILITY AND RESILIENCE

INTEGRATED PERFORMANCE



PV PAVERS

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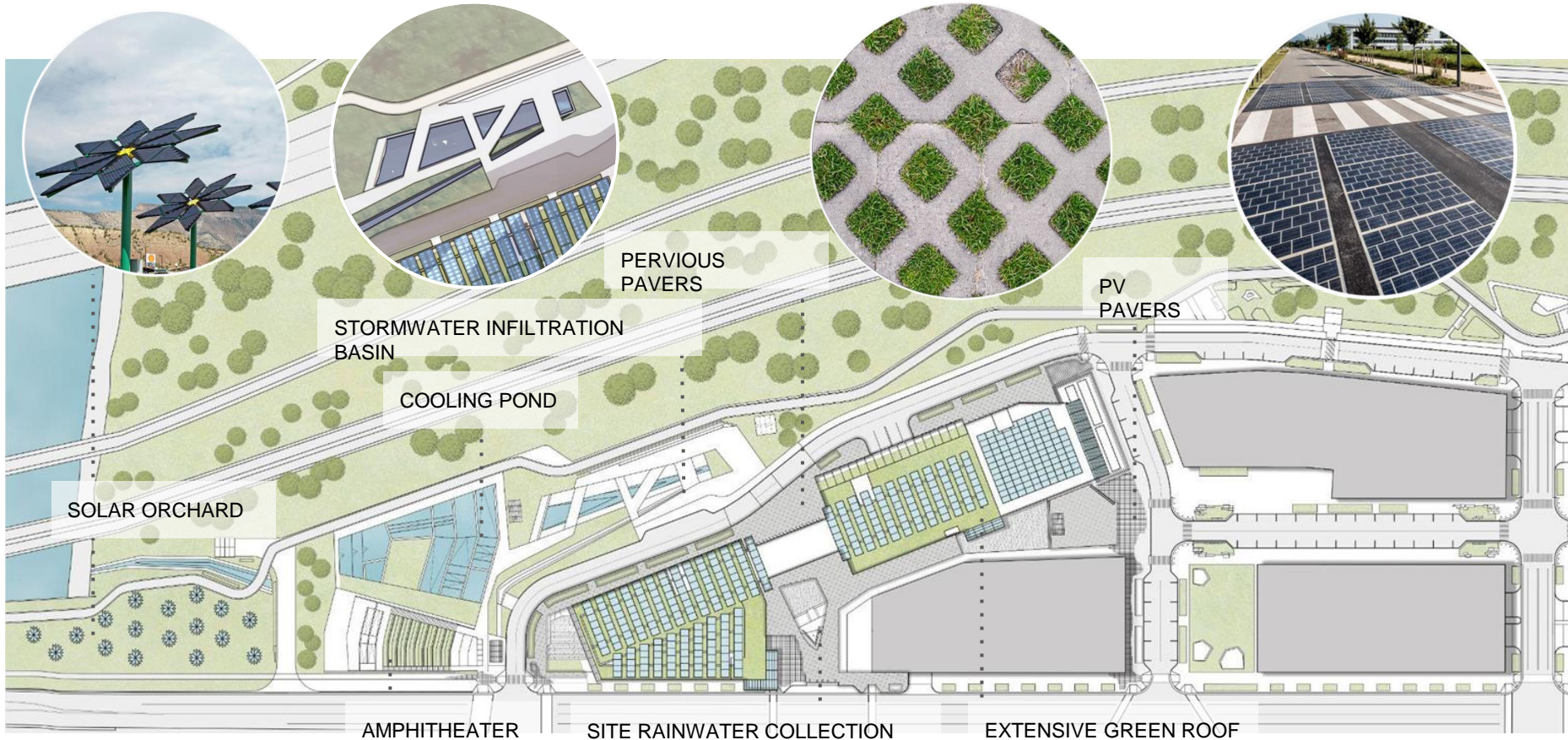
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DURABILITY AND RESILIENCE

INTEGRATED PERFORMANCE





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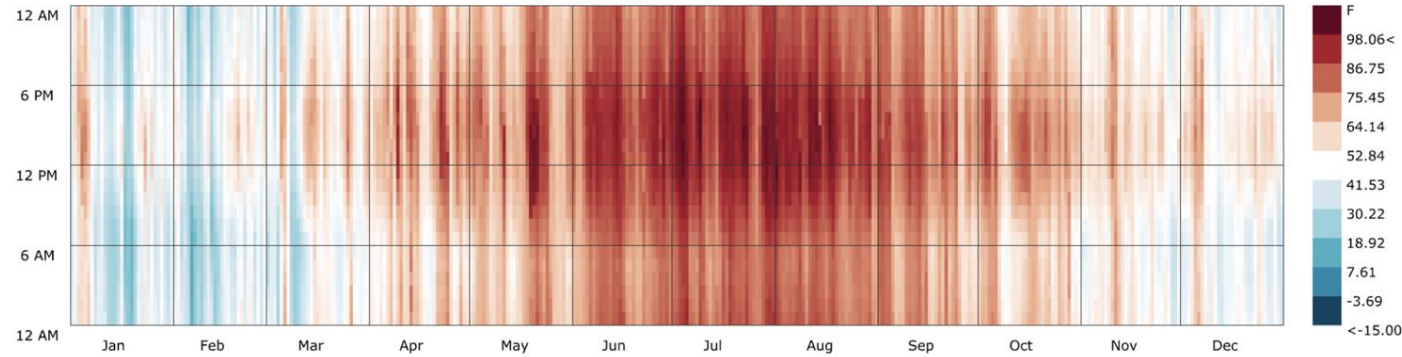
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DURABILITY AND RESILIENCE

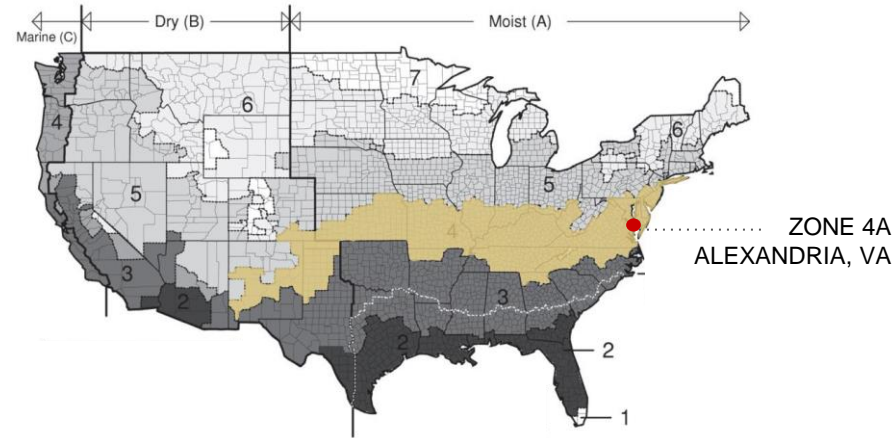
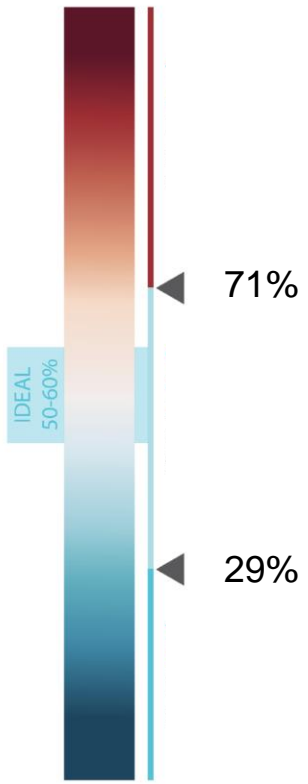
INTEGRATED PERFORMANCE



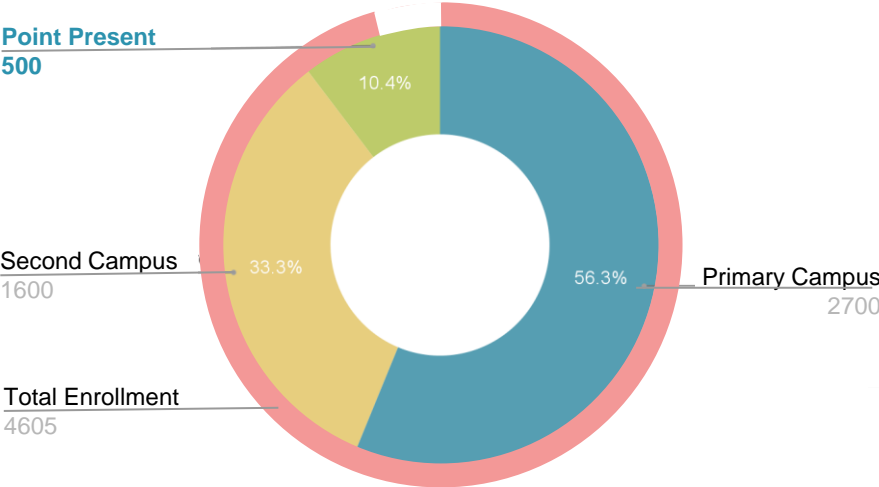
AVERAGE MONTHLY TEMPERATURE



YEARLY RELATIVE HUMIDITY



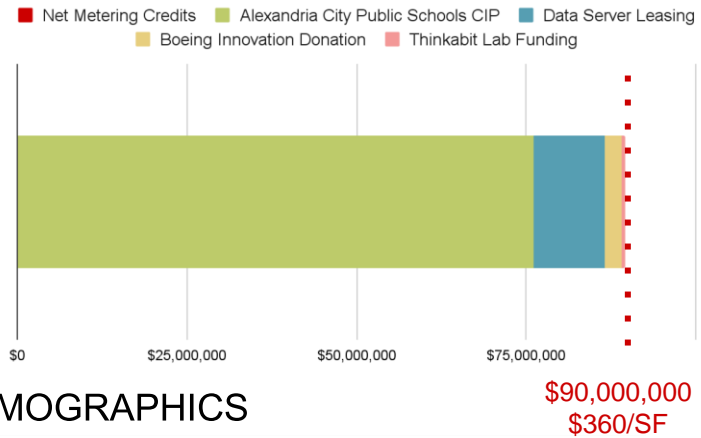
SCHOOL CAPACITY



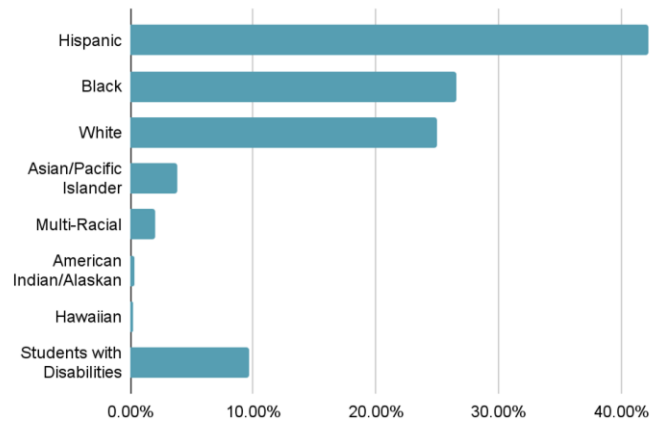
Current High School Enrollment: 4,118
Projected Enrollment: 4,605

Source: <https://www.acps.k12.va.us/Domain/794>

FUNDING SOURCES



DEMOGRAPHICS



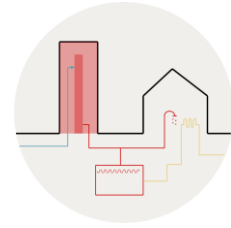
DESIGN OBJECTIVES



01
Normalize high
performance
building



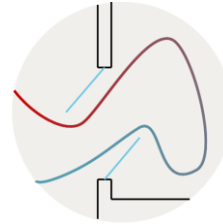
02
Utilize the
building as a
teaching tool



03
Distribute heat
and energy



04
Implement
microgrid



05
Maximize passive
design strategies

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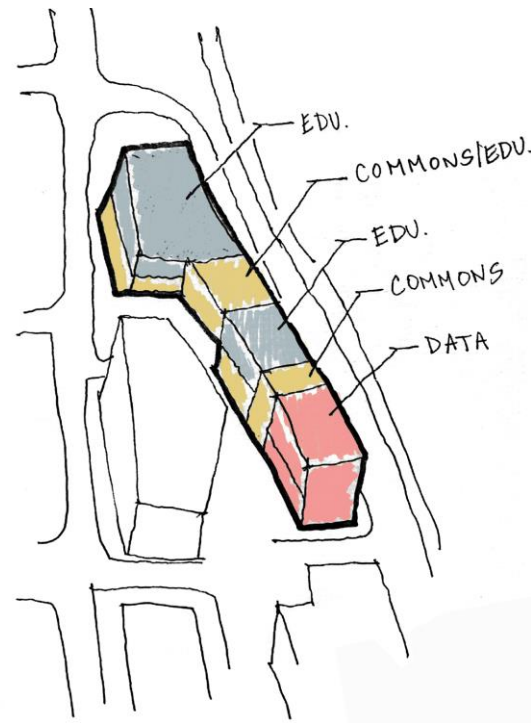
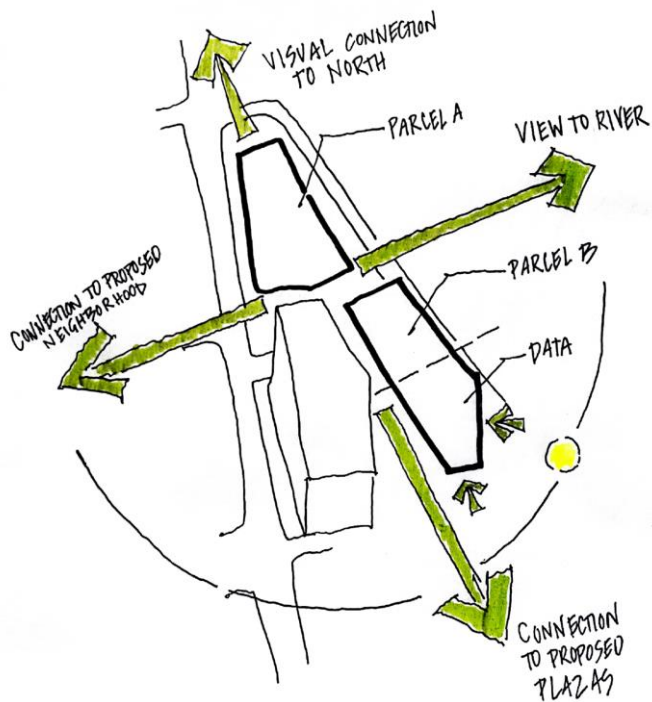
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DESIGN CONSTRAINTS AND GOALS

PROGRAM



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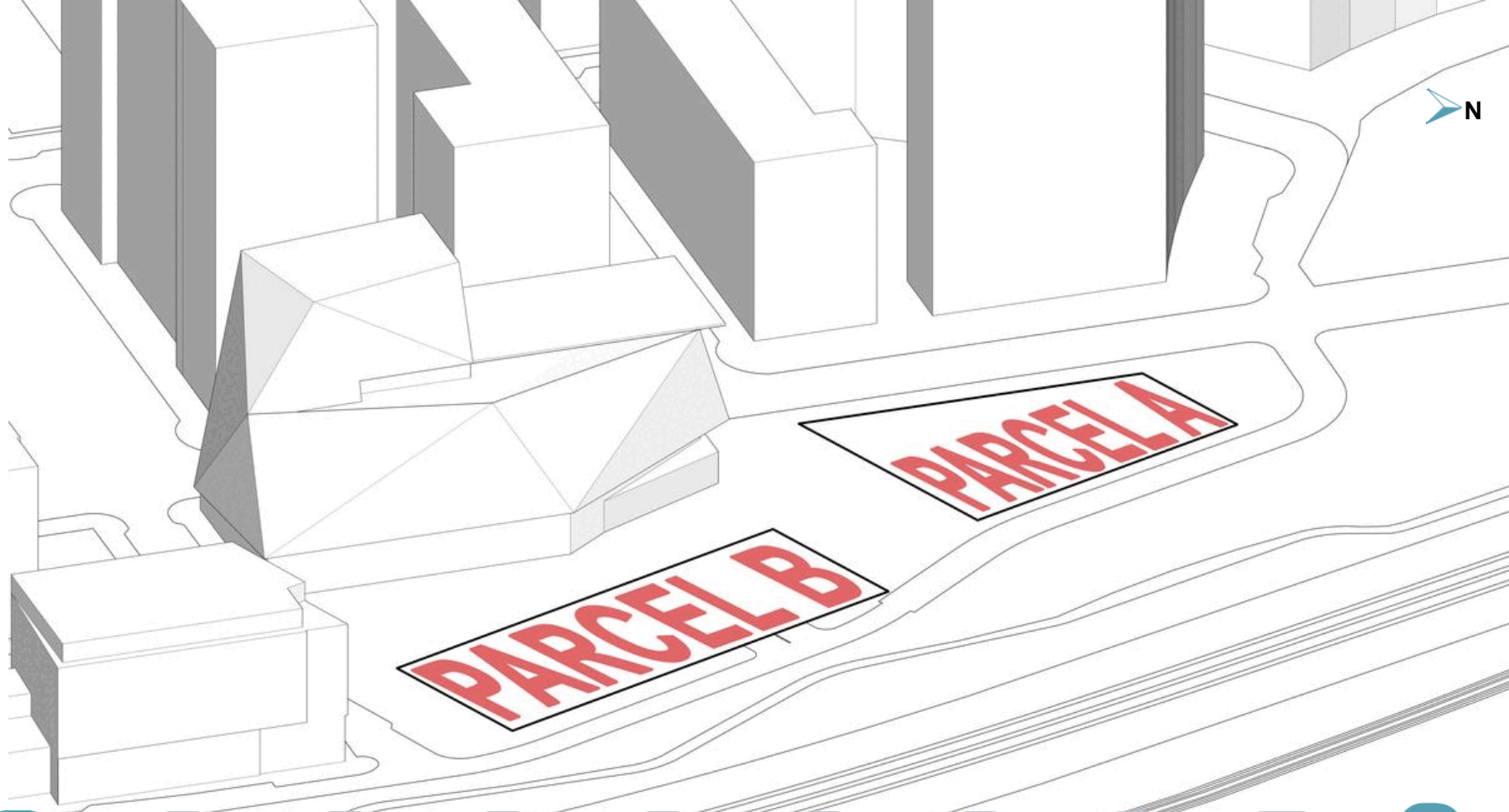
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ARCHITECTURE



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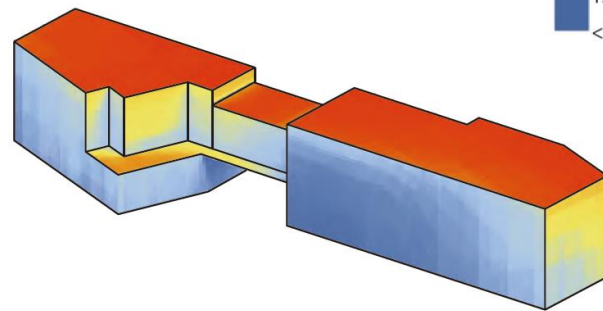
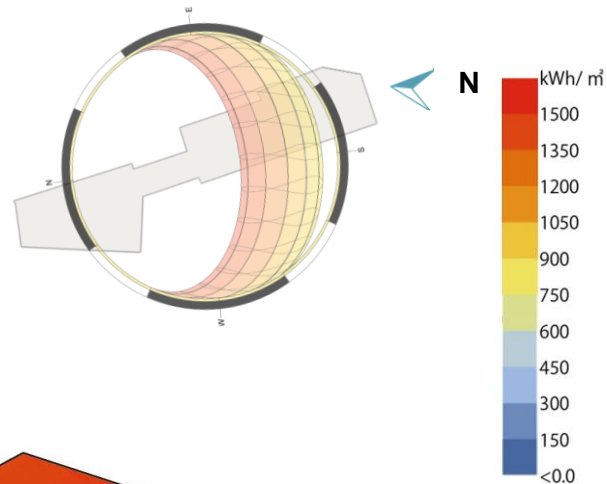
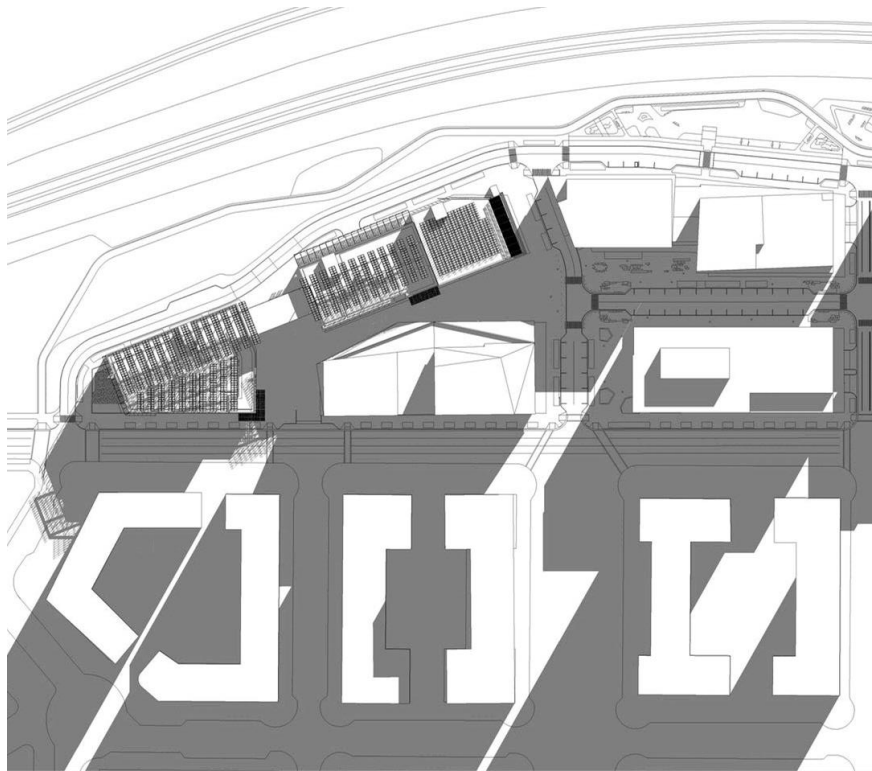
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ARCHITECTURE

FALL EQUINOX

8 am - 3 pm



WEST FACADE

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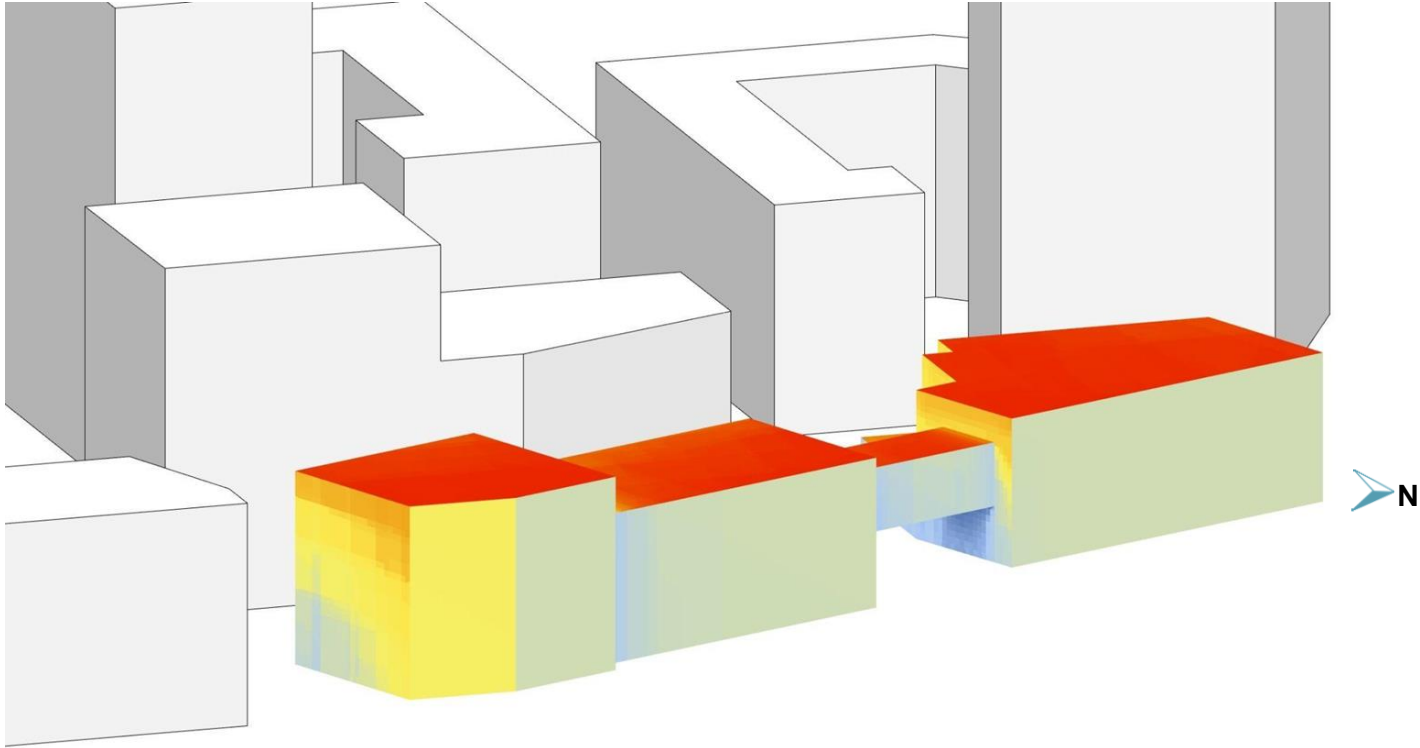
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INTEGRATED PERFORMANCE

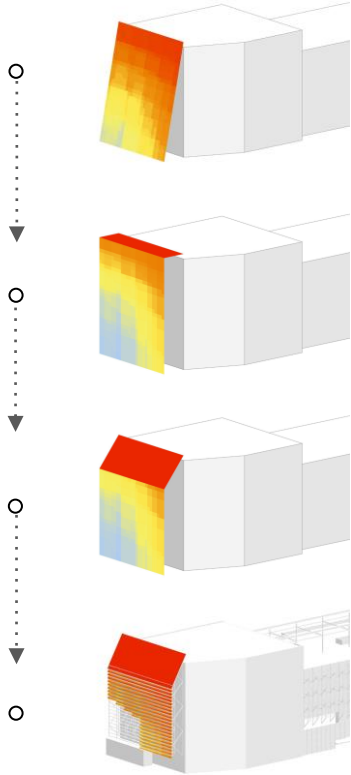
ENERGY PERFORMANCE



ANNUAL SOLAR EXPOSURE **WITHOUT** SOLAR STRATEGIES



SOUTH FACADE
ITERATIONS



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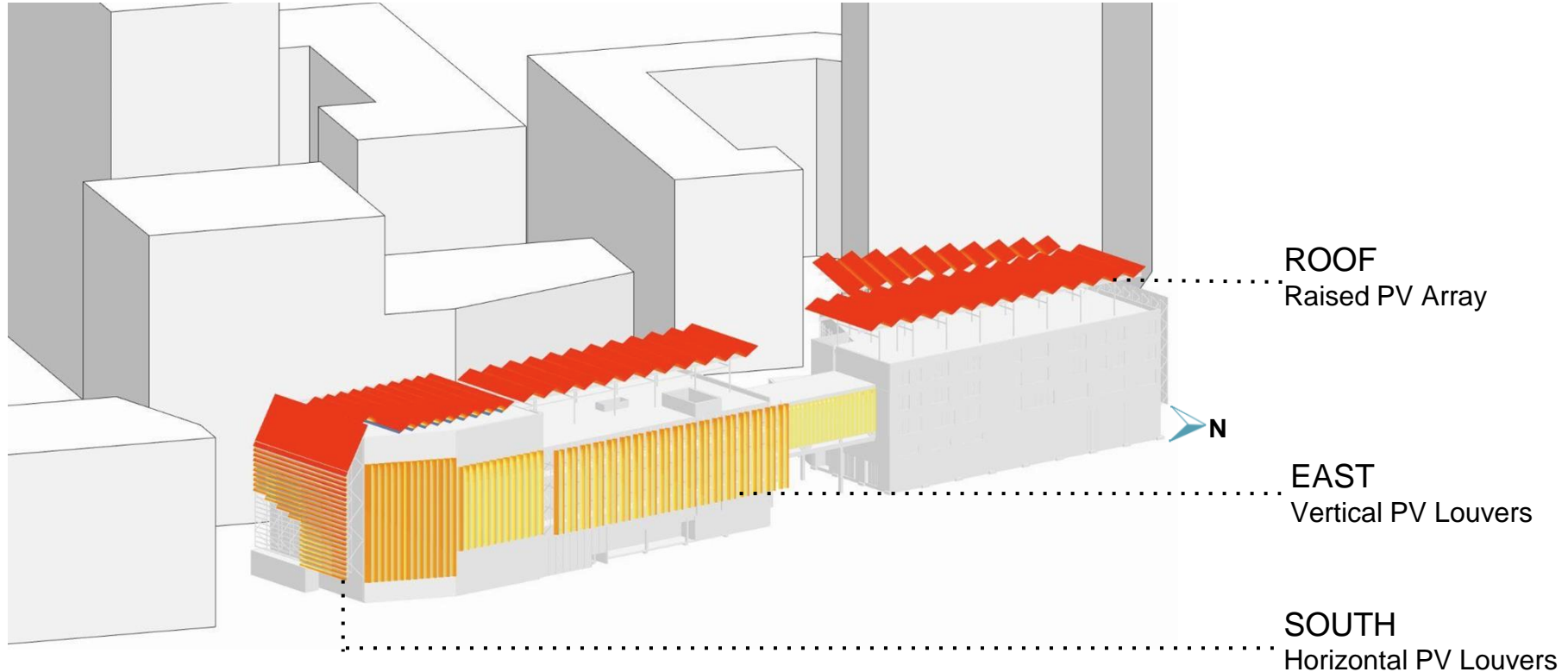
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INTEGRATED PERFORMANCE

ENERGY PERFORMANCE



ANNUAL SOLAR EXPOSURE **WITH** SOLAR STRATEGIES



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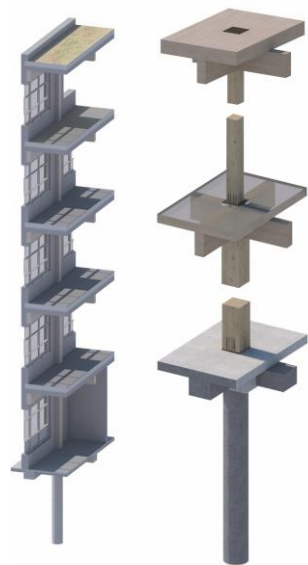
09

INTEGRATED PERFORMANCE

ENERGY PERFORMANCE



TYPICAL WALL SECTION CLT AND GLULAM



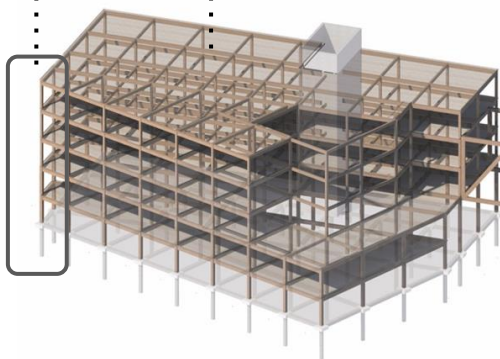
ROOF TO COLUMN
CONNECTION

COLUMN TO CLT
FLOOR PANEL
CONNECTION

COLUMN BASE
TO CONCRETE
FLOOR
CONNECTION

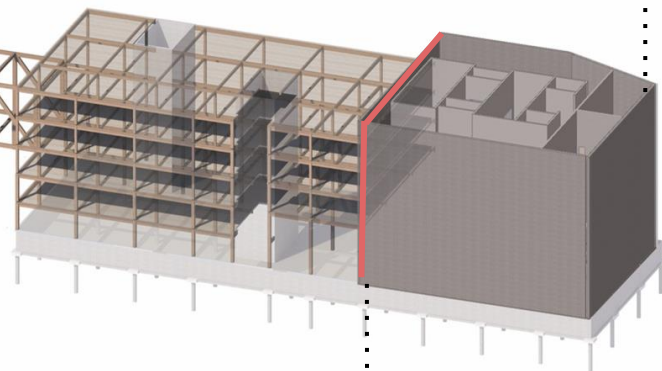
HIGH SCHOOL

CLT PANELS
GLULAM BEAMS AND COLUMNS



DATA CENTER

ICF WITH LOW CARBON CONCRETE



2 HR FIRE SEPARATION



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ARCHITECTURE

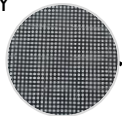
EMBODIED ENVIRONMENTAL IMPACT



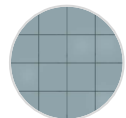
PHOTOVOLTAIC ROOF CANOPY



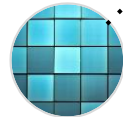
INTERACTIVE DIGITAL
DISPLAY



INSULATED METAL PANELS



CHARRED WOOD SIDING



PHOTOVOLTAIC
GLASS PANELS

PHOTOVOLTAIC LOUVERS



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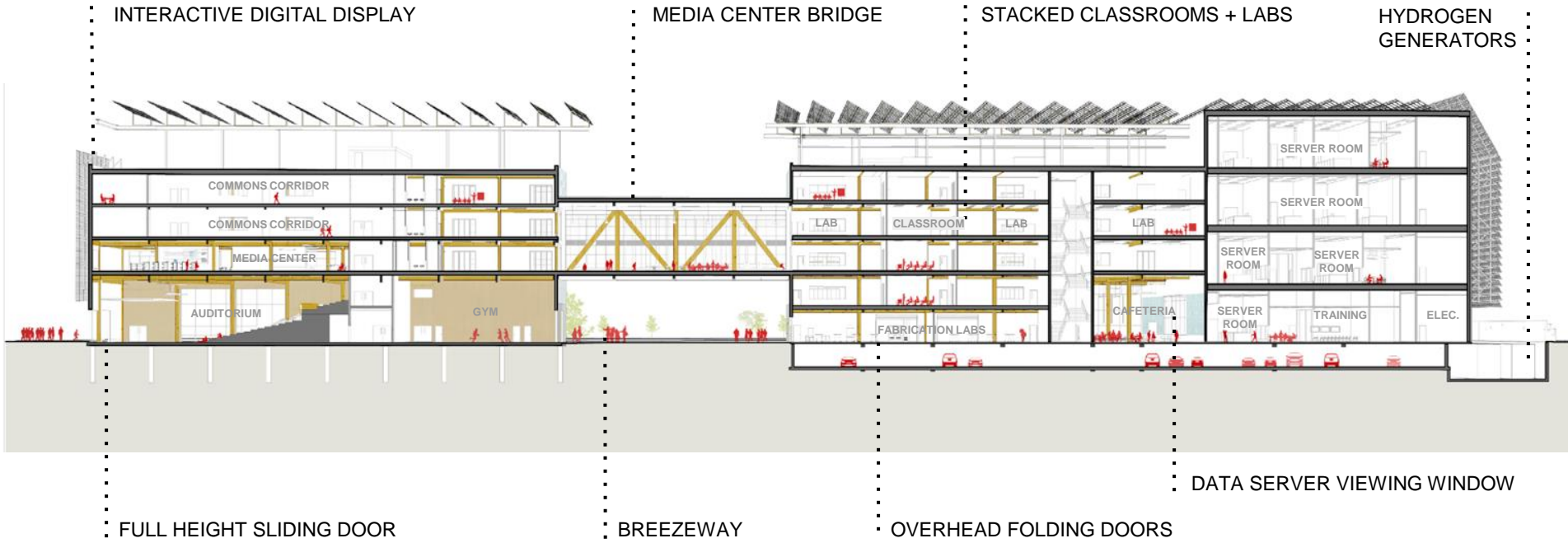
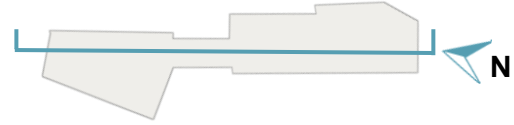
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ARCHITECTURE

EMBODIED ENVIRONMENTAL IMPACT

ENERGY PERFORMANCE





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ARCHITECTURE

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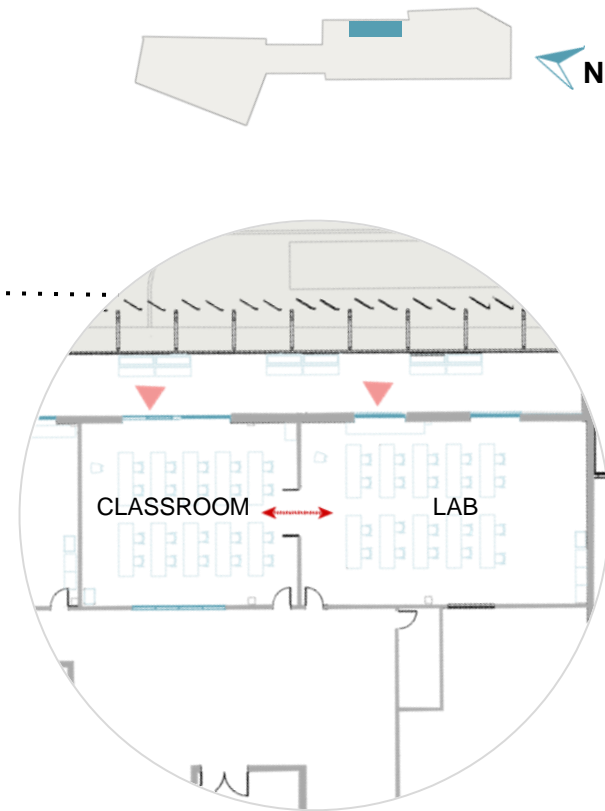
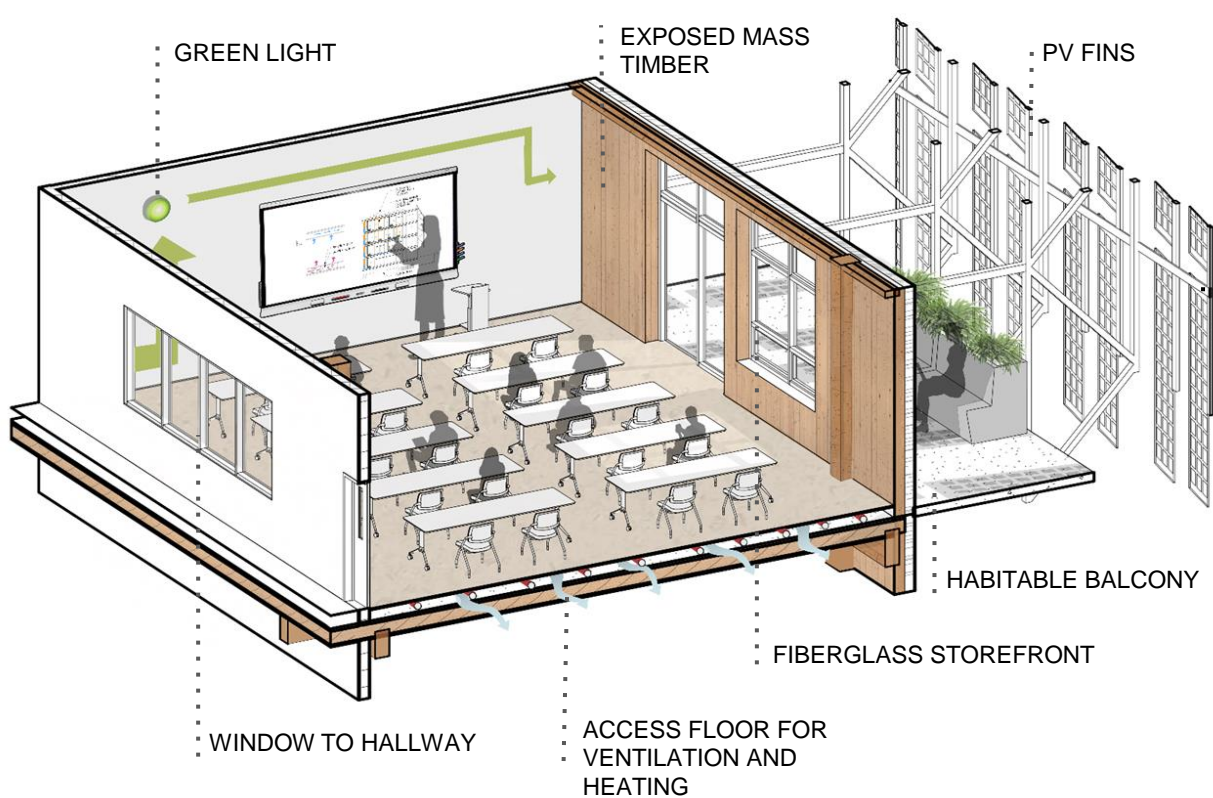
OCCUPANT EXPERIENCE

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TYPICAL CLASSROOM



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ARCHITECTURE

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INTEGRATED PERFORMANCE

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COMFORT AND ENVIRONMENTAL QUALITY

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EAST
CLASSROOM
BALCONY

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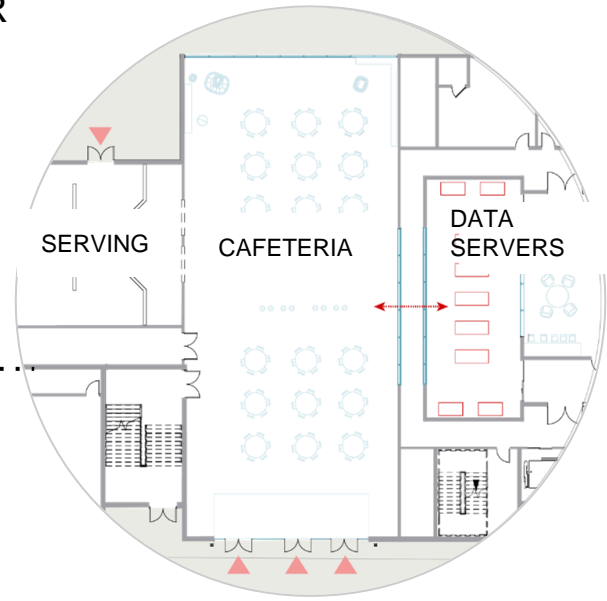
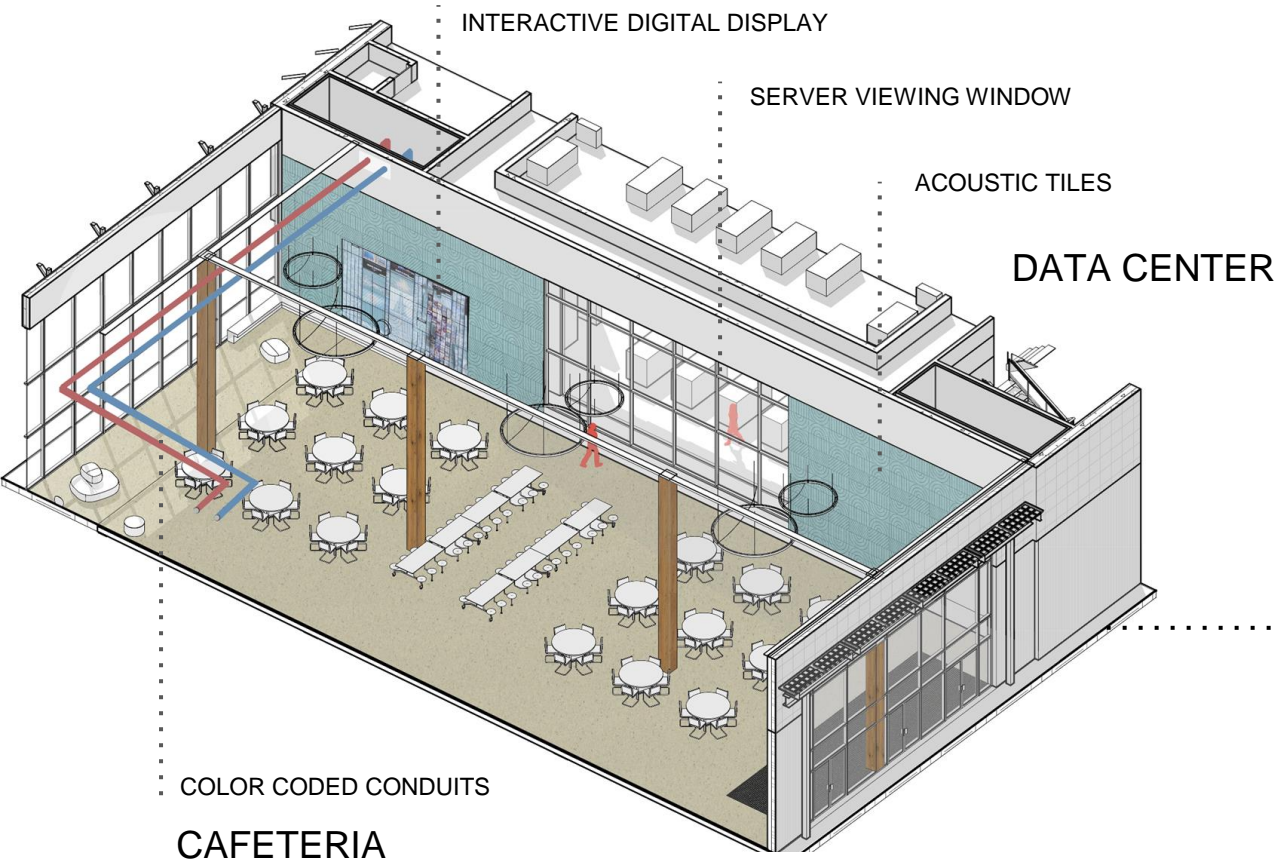
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ARCHITECTURE

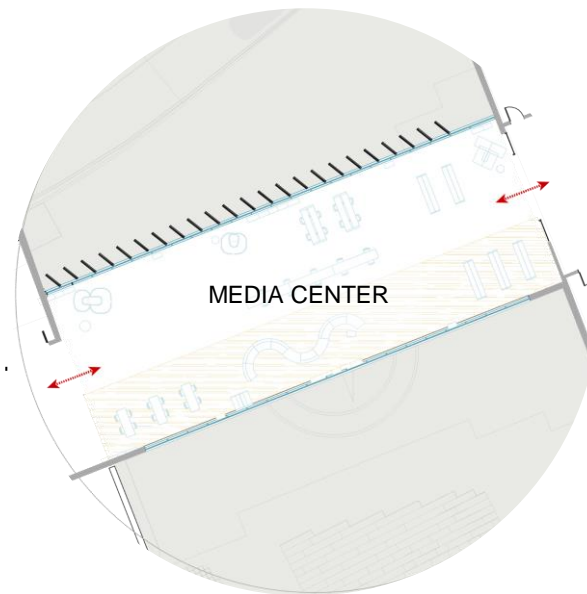
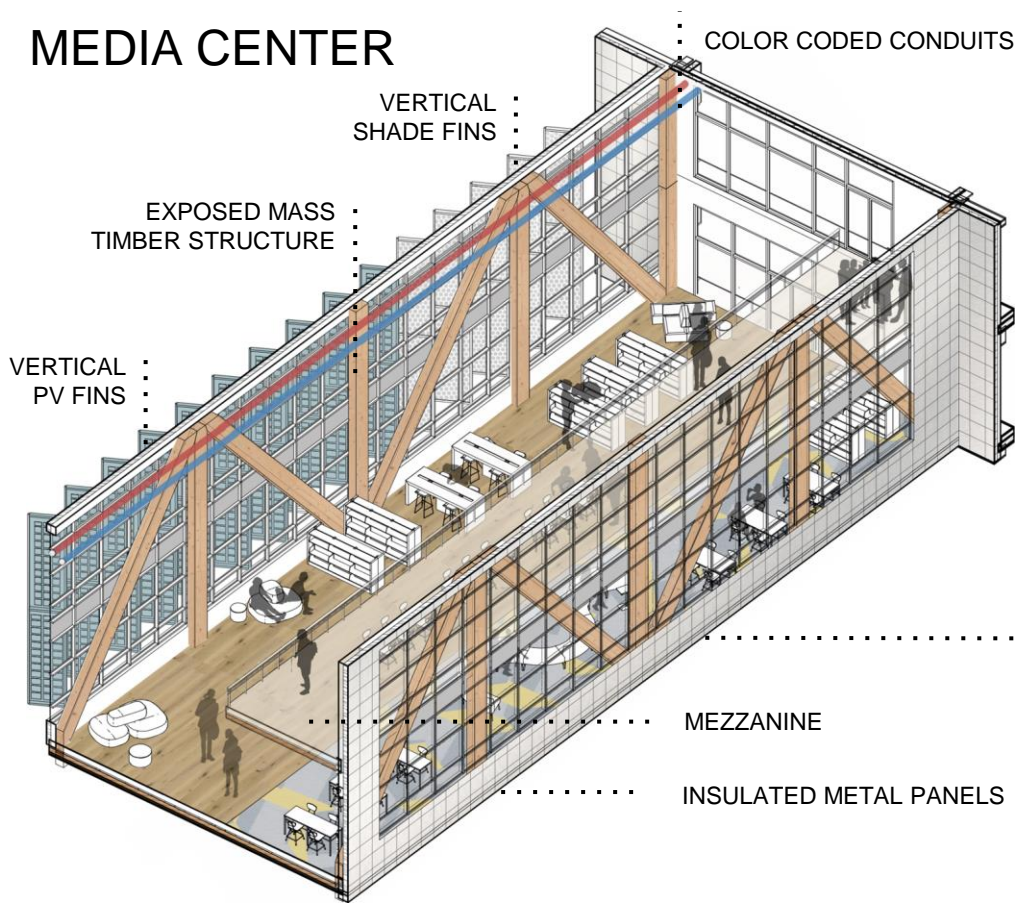
INTEGRATED PERFORMANCE

OCCUPANT EXPERIENCE





MEDIA CENTER



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ARCHITECTURE

OCCUPANT EXPERIENCE

COMFORT AND ENVIRONMENTAL QUALITY





BUILDING A
COMMONS

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ARCHITECTURE

OCCUPANT EXPERIENCE





1ST FLOOR
LAB SPACE

CIRCADIAN LIGHTING



8 am



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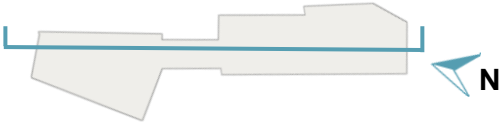
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INTEGRATED PERFORMANCE

COMFORT AND ENVIRONMENTAL QUALITY



DAYLIGHT + OCCUPANCY LIGHTING



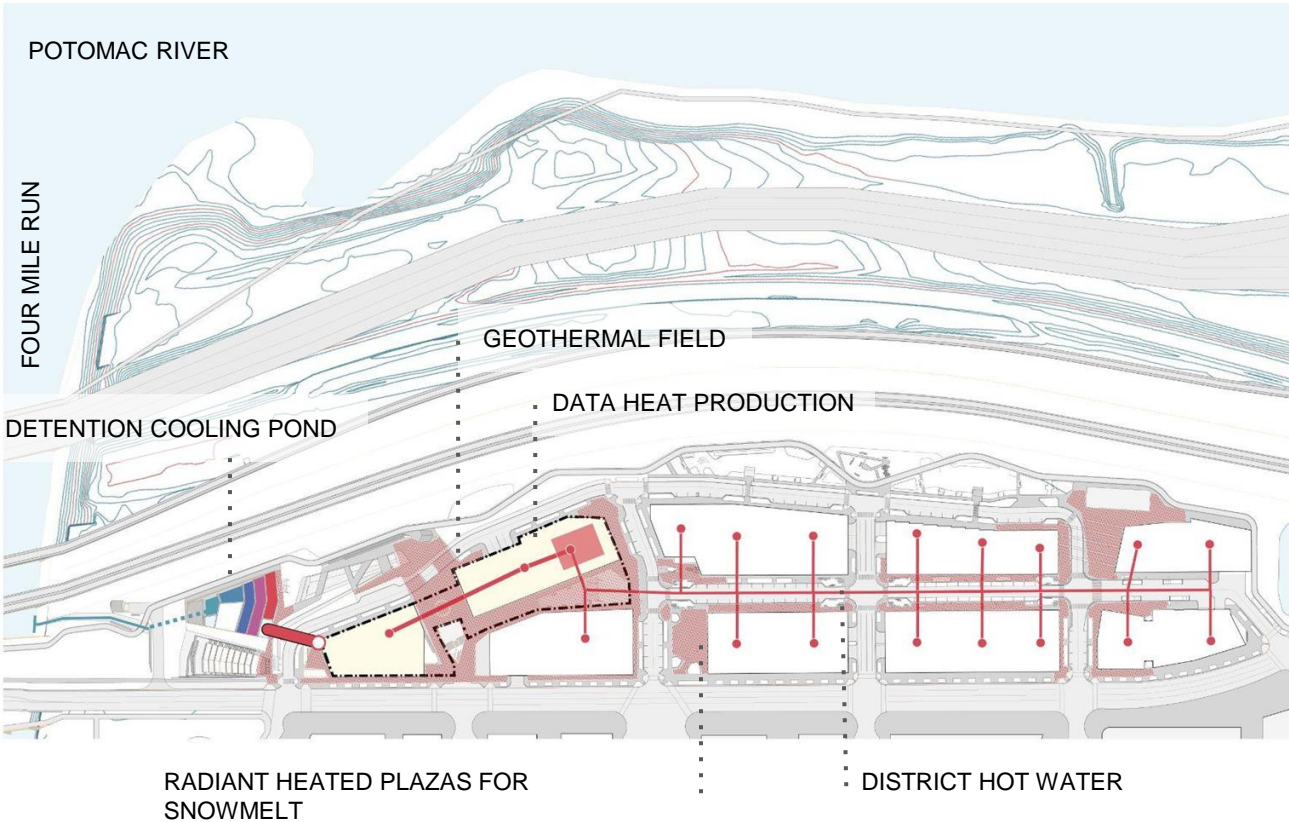
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INTEGRATED PERFORMANCE

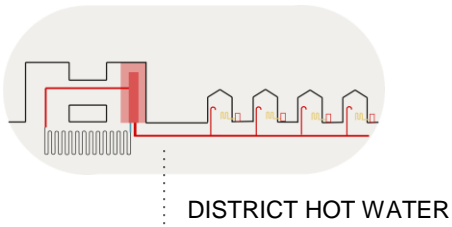
COMFORT AND ENVIRONMENTAL QUALITY



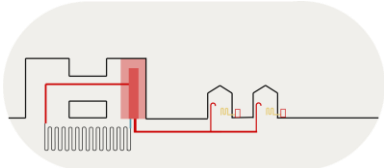
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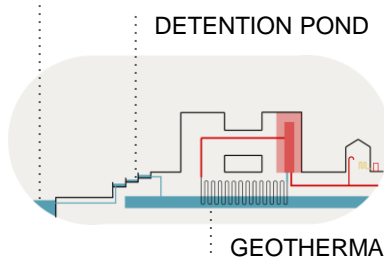
SUMMER



WINTER



FOUR MILE RUN



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ENGINEERING

DURABILITY AND RESILIENCE



DATA CENTER HEAT EXCHANGE



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ENGINEERING

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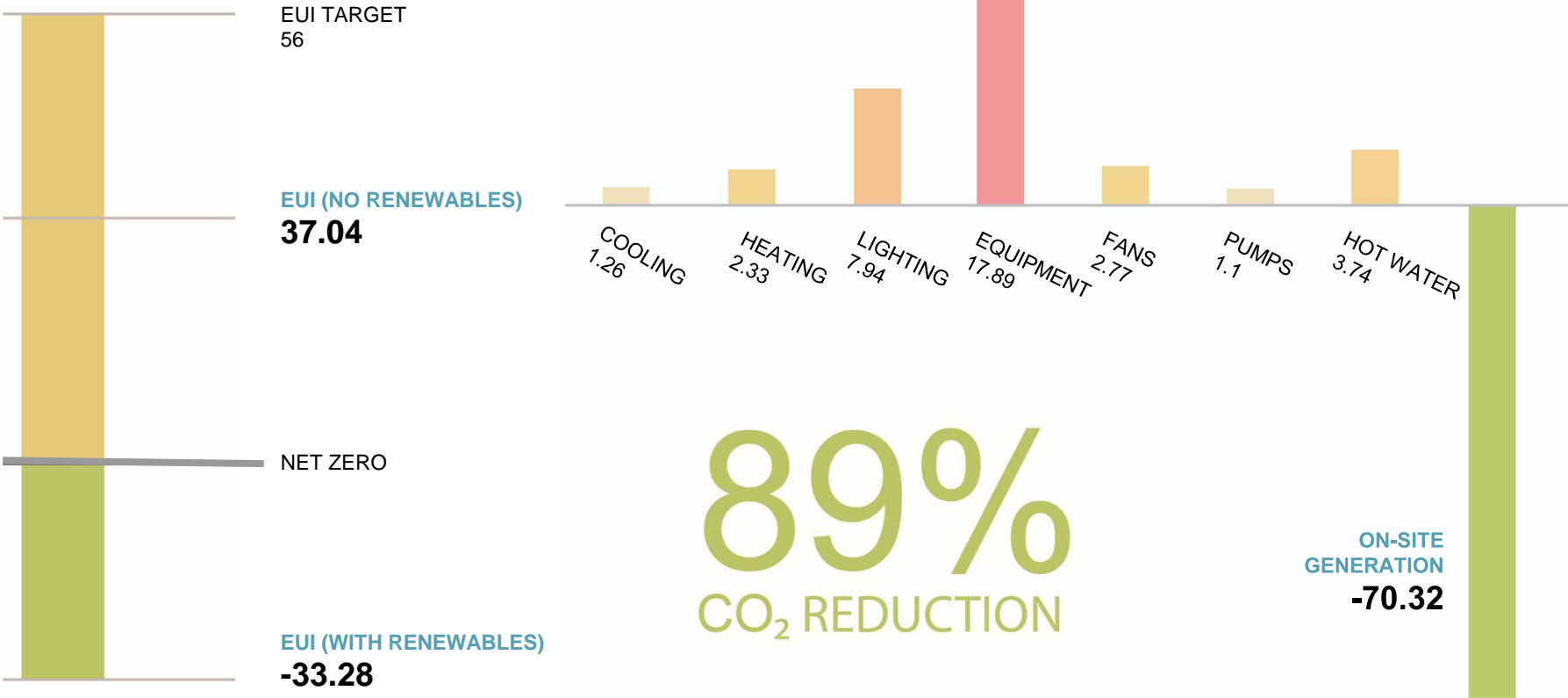
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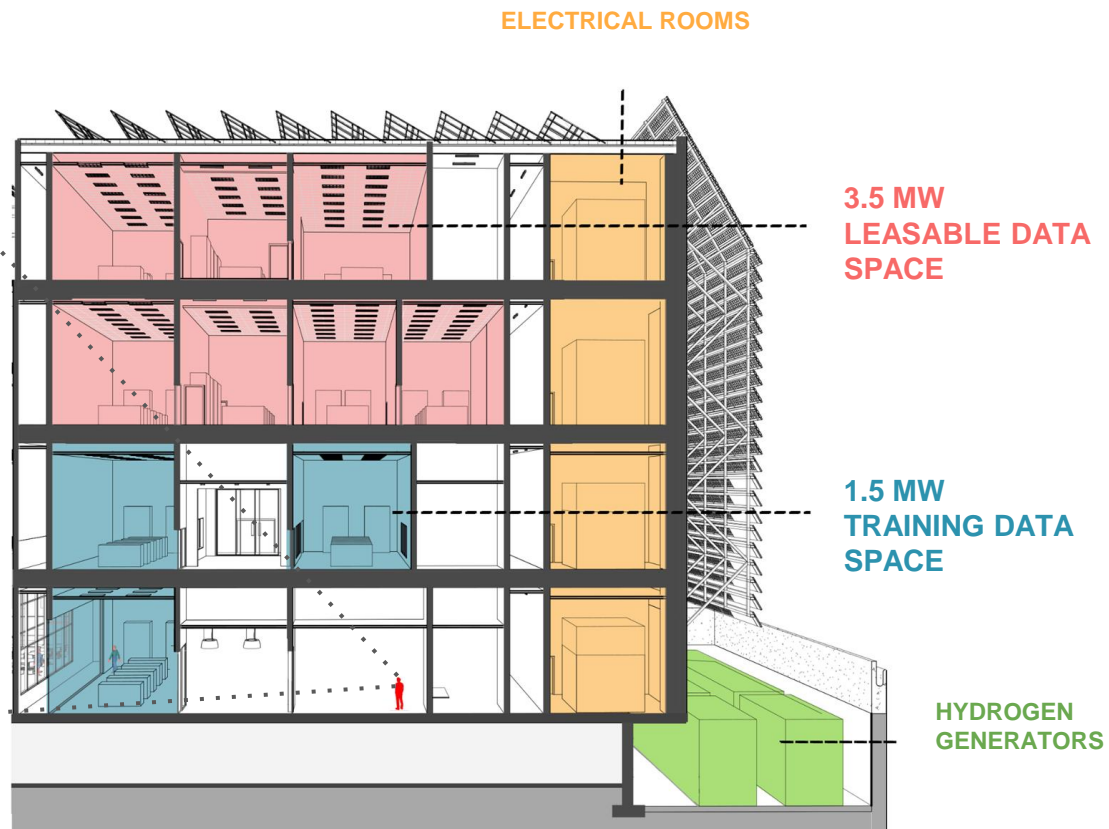
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HIGH SCHOOL EUI SOURCE METRICS (kBtu/ft²/yr)





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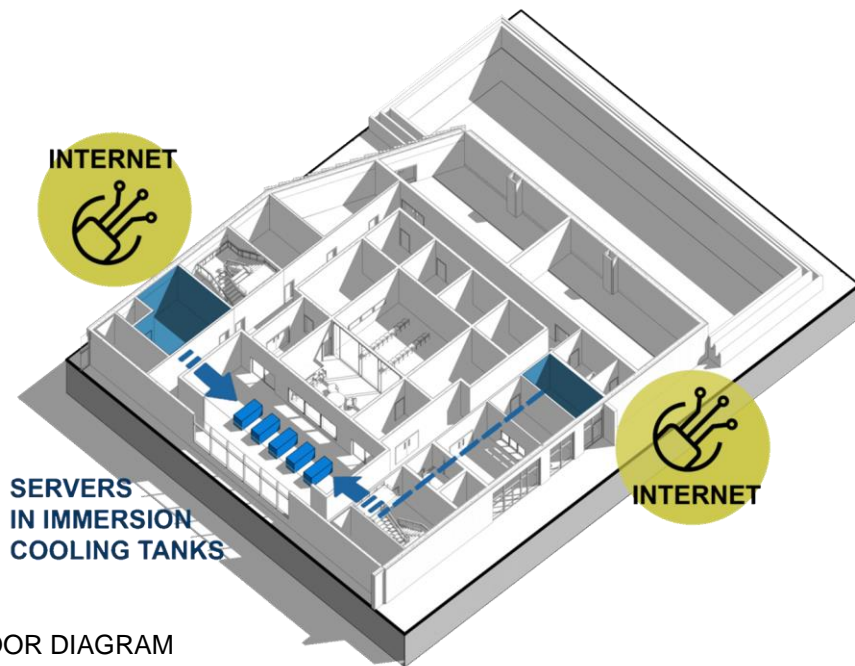
ARCHITECTURE

ENGINEERING

OCCUPANT EXPERIENCE



DATA
CENTER = INTERNET + ELECTRICITY



FIRST FLOOR DIAGRAM

POWER USE EFFICIENCY



POINT PRESENT
1.08 PUE

INDUSTRY STANDARD
1.67 PUE

DATA CENTER INFRASTRUCTURE EFFICIENCY



POINT PRESENT
93% DCIE

INDUSTRY STANDARD
47% DCIE

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ENGINEERING

INTEGRATED PERFORMANCE







Photo Credit: Andarge Asfaw



W A C

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Melody Wang, PE, LEED AP BD+C, WELL AP

Affiliated Engineers, Inc.

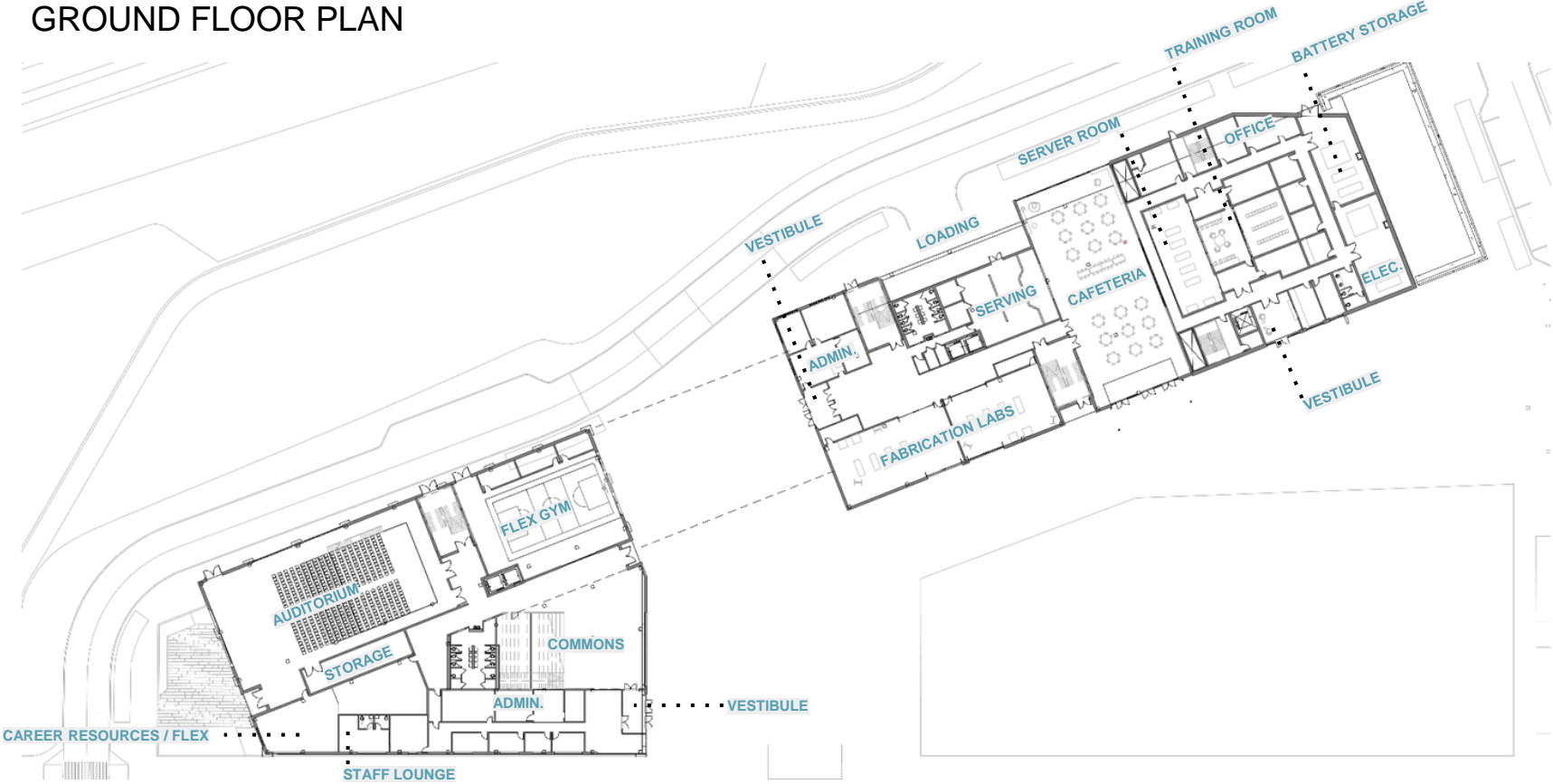
Submer

Immersion Cooling Systems



SUPPLEMENTAL DRAWINGS

GROUND FLOOR PLAN



THIRD FLOOR PLAN - TYPICAL

